DESIGN WORKSHEET
REINFORCED CONCRETE DROP BOX SPILLWAY
ISLAND TYPE STRUCTURES

Owner _____ Field No. _____

Designer _____ Date _____ Checker _____ Date _____

structure drainage area = _____ weir elevation = _____
design depth of waterway = _____ outlet elevation = _____
waterway sideslope = _____:1 overfall = _____

For Runoff use Engineering Field Handbook, Chapter 2 and Form MO-ENG-13

Minimum Capacity from Missouri Practice Standard 410, Grade Stabilization Structure

Q_{b1} = Principal Spillway Design Capacity = _____ cfs for _____ year, 24-hour storm
Q_t = Total Capacity = _____ cfs for _____ year, 24-hour storm

SIZING STRUCTURE

Select structure dimensions to fit capacity, outlet channel, overfall, and available head.

Dimensions

box width (w) = _____ head (h_1) = _____ (to crest of auxiliary spillway)
box depth (b) = _____
overfall (f) = _____ head (h_2) = _____ (to top of headwall)
weir length (ℓ) = _____

BOX INLET WEIR CAPACITY

$$Q_b = \frac{(C_1) \times (C_2) \times 3.43 \times h^{3/2} \times \ell}{1.1 + 0.01f}$$

$\frac{h_1}{w}$ = ____ = _____ $C_{1(1)}$ = 0.76 from Sheet 2

$\frac{h_2}{w}$ = ____ = _____ $C_{1(2)}$ = 0.76 from Sheet 2

$\frac{b}{w}$ = ____ = _____ C_2 = 0.98 from Sheet 2

Design Capacity = Q_{b1} = $\frac{0.76 \times 0.98 \times 3.43 \times \_\_\_\_^{3/2} \times \_\_\_\_}{1.1 + 0.01f}$

= 0.00 cfs @ Auxiliary Spillway Crest

Design Capacity = Q_{b2} = $\frac{0.76 \times 0.98 \times 3.43 \times \_\_\_\_^{3/2} \times \_\_\_\_}{1.1 + 0.01f}$

= 0.00 cfs @ Top of Headwall

DESIGN WORKSHEET
REINFORCED CONCRETE DROP BOX SPILLWAY
ISLAND TYPE STRUCTURES

Table 1. – *Correction for head*
(Control at box-inlet crest)

Factor C_1

h/w	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0						0.76	0.80	0.82	0.84	0.86
0.1	0.87	0.88	0.89	0.90	0.91	0.91	0.92	0.92	0.93	0.93
0.2	0.93	0.94	0.94	0.95	0.95	0.95	0.95	0.96	0.96	0.96
0.3	0.97	0.97	0.97	0.97	0.98	0.98	0.98	0.98	0.98	0.98
0.4	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	1.00
0.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.6	1.00									

Correction is 1.00 when ***h/w*** exceeds 0.6.

TABLE 2. – *Correction for box-inlet shape*
(Control at box-inlet crest)

Factor C_2

b/w	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0	0.98	1.01	1.03	1.03	1.04	1.04	1.03	1.02	1.01	1.01
1	1.00	0.99	0.99	0.98	0.98	0.98	0.97	0.97	0.96	0.96
2	0.96	0.96	0.95	0.95	0.95	0.95	0.95	0.95	0.94	0.94
3	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.93	0.93
4	0.93									

APPROACH CHANNEL DIMENSIONS

1. Minimum width shall be $BW = 2L\text{-}h_2z$ L = weir length, h_2 = head at top of headwall, z = sideslopes
   BW = _____ (Use _____ ft.)
2. Slope shall be flat upstream far enough to encompass the entrance to the auxiliary spillway.

AUXILIARY SPILLWAY

$q_a = 2.75\ H^{3/2} = 2.75 \times$ _____ $^{3/2}$ = 0.00 cfs (Auxiliary Spillway Discharge per foot of width)

Q_t _____ minus Q_{b2} 0.00 = Q_a _____ (total required)

Auxiliary Spillway Crest elevation = 0.5' lower than top of headwall = _____

Auxiliary Spillway sideslope = _____:1

Auxiliary Spillway width = $\frac{Q_a}{q_a} = \frac{\quad}{0.00}$ = _____ ft. (Use _____ ft.)

H = flow depth = _____ ft. (for auxiliary spillway discharge)

free board = _____ ft.; top of fill elevation = _____